Ref. 1

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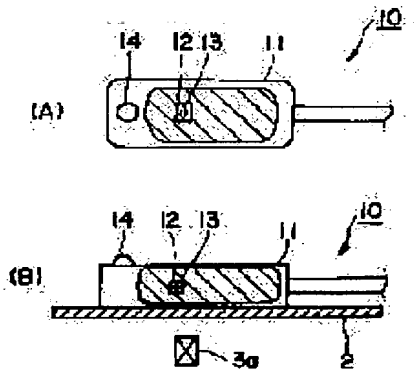
(54) CONTACTLESS MAGNETIC SWITCH

(57)Abstract:
PROBLEM TO BE SOLVED: To surely detect the position of a magnet without regard to the direction of its polarity by placing two hole devices reverse to each other.
SOLUTION: A contactless magnetic switch 10 includes two hole devices 12 and 13 contained in a case 11, a pilot lamp 14 attached on the surface of the case 11, and a power circuit and a detection circuit contained in the case 11. Both devices 12 and 13 are placed reverse to each other, so that they can detect the magnetic flux set reverse to each other. Then a constant voltage circuit stabilizes the constant voltage Vcc supplied from outside as the drive voltage by a Zener diode and a resistance which are connected in series to each other and supplies the stabilized drive voltage to a sensor circuit. A display output circuit turns on an LED serving as the lamp 14 based on the detection signals sent from the output terminals of devices 12 and 13 and also outputs the detection signals through the output terminals.



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CLAIMS

[Claim(s)]
[Claim 1] The non-contact mold MAG switch characterized by including the detector which outputs a detecting signal when a hall device detects magnetic flux based on change of the output current of a hall device by change of the power circuit which impresses driver voltage to two hall devices each other arranged by the reverse sense and these two hall devices, and the magnetic flux which acts on a hall device so that the magnetic flux of hard flow can be detected, respectively.
[Claim 2] The non-contact mold MAG switch according to claim 1 characterized by for two hall devices contacting mutually and arranging them.
[Claim 3] The non-contact mold MAG switch according to claim 2 characterized by locating two hall devices in a line mutually, and arranging them.
[Claim 4] The non-contact mold MAG switch according to claim 2 characterized by arranging two hall devices of each other back to back.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In the so-called pneumatic cylinder used when making pneumatic pressure perform mechanical work, this invention relates to the non-contact mold MAG switch which performs location detection using a magnet, especially the magnetic switch which used the hall device as a magnetometric sensor, in order to set up the optimal active position of the piston.
[0002]
[Description of the Prior Art] The former, for example, a pneumatic cylinder, is constituted as shown in drawing 7 . That is, in drawing 7 , the pneumatic cylinder 1 contains the bell shape cylinder tube 2, the piston 3 arranged possible [sliding] in accordance with shaft orientations in the inside of this cylinder tube 2, and the piston rod 4 attached in one to the piston 3. Here, the above-mentioned piston 3 equips the perimeter with the piston packing 3a and 3b of a duplex so that it may stick to the wall of a cylinder tube 2. Thereby, a pneumatic cylinder 1 performs various kinds of mechanical work by moving a piston 3 in accordance with shaft orientations within a cylinder tube 2 by fluctuation of the pneumatic pressure of the cylinder interior of a room divided by the piston 3, and driving the member connected with the piston rod 4.
[0003] Here, in order to detect the piston location of the above-mentioned pneumatic cylinder 1, as shown in drawing 7 , the location of a piston 3 is made to be detected by the magnetic switch's 6 detecting the field of the magnet 5, and making annunciator 6a prepared in the magnetic switch 6 turn on with migration of a piston 3 by forming the magnet 5 in the piston 3 and equipping the lateral surface of a cylinder tube 2 with the magnetic switch 6.
[0004] In order to follow, for example, to detect the location of the piston 3 in the both ends of the cylinder tube 2 of a pneumatic cylinder 1, he is trying to attach in the lateral surface near the both ends of a cylinder tube 2 the magnetic switch 6 mentioned above, respectively, as shown in drawing 8 . When a piston 3 arrives at the marginal location near the both ends of a cylinder tube 2 by such configuration, each magnetic switch 6 can detect a piston 3, respectively.
[0005] By the way, such a magnetic switch 6 had the problem that MR component was expensive and cost will become high, although what used the magnetic resistance element (MR component) was generally known as a non-contact mold magnetometric sensor. For this reason, the magnetic switch using a hall device is also known as a magnetometric sensor. A hall device is cheap in itself, and since it is 1/several costs as compared with MR component, the cost of the magnetic whole switch may be reduced.
[0006]
[Problem(s) to be Solved by the Invention] However, in the magnetic switch 6 using such a hall device, since the hall device has the polarity, it does not have sensibility about the magnetic flux of a specific direction. When two magnetic switches 6 of the same configuration were attached

in the lateral surface of a cylinder tube 2 so that it may become the reverse sense mutually as it follows, for example, is shown in drawing 8 , it took for one magnetic switch 6 being failure of the magnetic switch 6, in order that the hall device may not sense the magnetic flux of a magnet 5 prepared in the piston 3 in many cases.

[0007] Moreover, although it is necessary by specifying the attachment direction of the magnetic switch 6 to attach two magnetic switches 6 in the same direction, respectively about the both ends of a cylinder tube 2 as shown in drawing 9 In this case, due to the connecting cord from the magnetic switch 6, one magnetic switch 6 (in the case of illustration right-hand side magnetic switch 6) cannot be attached in the edge of a cylinder tube 2, but only distance x must be attached in an inside location from an edge. For this reason, there was a problem that the edge location of a piston 3 could not no longer be detected correctly.

[0008] In view of the above point, this invention aims at offering the non-contact mold MAG switch using a hall device with which location detection may have been made to be ensured, even if the magnetic polarity of the magnet which should be detected is which direction.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the non-contact mold MAG switch by this invention Two hall devices each other arranged by the reverse sense so that the magnetic flux of hard flow could be detected, respectively, When a hall device detects magnetic flux based on the change of the current which flows a hall device by change of the power circuit which impresses driver voltage to these two hall devices, and the magnetic flux which acts on a hall device, it is characterized by including the detector which outputs a detecting signal.

[0010] Preferably, two hall devices contact mutually and the non-contact mold MAG switch by this invention is arranged.

[0011] Preferably, two hall devices are mutually located in a line, and the non-contact mold MAG switch by this invention is arranged.

[0012] Preferably, two hall devices contact back to back, and, as for the non-contact mold MAG switch by this invention, each other are arranged.

[0013] According to the above-mentioned configuration, since two hall devices of each other are arranged by the reverse sense, even if it is the magnetic flux of the sense of which, one of hall devices may sense this magnetic flux. That is, by approach of this magnet for detection, even if the magnetic polarity of the magnet for detection attached in the body which should be detected is which direction, when one of hall devices senses the magnetic flux of the magnet concerned, a detector outputs a detecting signal. By this, the location of the magnet concerned and the body which should be detected may be detected. Therefore, since a non-contact mold MAG switch will not have a polarity, for example the attachment direction is not specified to a pneumatic cylinder etc., it is not necessary to check whether the attachment direction of this magnetic switch and the direction of the magnetic polarity of the magnet for detection are correct with constraint with the narrow attaching position so that anchoring may not become impossible.

[0014] When two hall devices contact mutually and are arranged, the detection location of each hall device will approach most mutually, and more exact location detection can be performed.

[0015]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail based on the operation gestalt shown in the drawing. Drawing 1 shows 1 operation gestalt of the non-contact mold MAG switch by this invention. That is, in drawing 1 , the non-contact mold MAG switch 10 includes two hall devices 12 and 13 prepared in the interior of a case 11, the annunciator 14 attached in the front face of a case 11, and the power circuit and detector which it had in the case 11. The above-mentioned hall devices 12 and 13 are hall devices of the usual configuration, respectively, and each other are arranged by the reverse sense so that the magnetic flux of hard flow can be detected, respectively. In this case, the hall devices 12 and 13 of each other are contacted and arranged back to back.

[0016] Drawing 2 shows an example of the electric configuration of the non-contact mold MAG switch 10. That is, in drawing 2 , the non-contact mold MAG switch 10 consists of the sensor circuit 15, a voltage stabilizer 16 as a power circuit, a display output circuit 17 as a detector, and a protection network 18.
[0017] The sensor circuit 15 carries out the ****** output of the sensing signal from output terminals 12a and 13a one, when they detect the magnetic flux of a magnet etc., while the constant voltage V from a voltage stabilizer 16 is impressed to two hall devices 12 and 13 as driver voltage, respectively.
[0018] A voltage stabilizer 16 is stabilized as driver voltage V by zener diode 16a and resistance 16b by which the constant voltage Vcc supplied from the outside was mutually connected to the serial, and is supplied to the sensor circuit 15 through transistor 16c.
[0019] The display output circuit 17 outputs a detecting signal from an output terminal Vout through two switching transistors 17b and 17c while LED17a as an indicating lamp lights up based on the sensing signal from the output terminals 12a and 13a of hall devices 12 and 13.
[0020] While a protection network 18 protects driver voltage Vcc by diode 18a and capacitor 18b, the detecting signal from the display output circuit 17 is made not to become through zener diode 18c more than a predetermined electrical potential difference.
[0021] The non-contact mold MAG switch 10 by this invention is attached in the lateral surface of the cylinder tube 2 of a pneumatic cylinder, in order to be constituted as mentioned above, for example, to detect the piston location of a pneumatic cylinder. In this condition, since both the output terminals 12a and 13a of hall devices 12 and 13 are L level, LED17a is not turned on, since the magnetic flux of a magnet does not act to hall devices 12 and 13, but both the transistors 17b and 17c serve as ON, ground connection of the output terminal Vout will be carried out for the non-contact mold MAG switch 10 through transistor 17b, and an output terminal Vout usually serves as low impedance.
[0022] Here, as shown in drawing 1 , when magnet 3a attached in the piston 3 of a pneumatic cylinder approaches, one of the hall devices 12 or 13 will sense the magnetic flux by magnet 3a among hall devices 12 and 13, and a current will be passed to the output terminal 12a or 13a side. Thereby, a signal is outputted from output terminals 12a or 13a. Therefore, since Transistors 17b and 17c become off while LED17a turns on the display output circuit 17 with this signal, an output terminal Vout serves as opening level. In this way, the location of a magnet 3a and the body which should be detected, i.e., a piston, will be detected.
[0023] Drawing 3 shows the second operation gestalt of the non-contact mold MAG switch by this invention. In drawing 3 , if the non-contact mold MAG switch 20 removes the point that York 21 and 22 is attached in order to raise the sensibility to magnetic flux to each hall devices 12 and 13 as compared with the non-contact mold MAG switch 10 shown in drawing 1 , respectively, it is the same configuration. Since according to this configuration the magnetic flux from magnet 3a will be brought together in these York 21 and 22 and hall devices 12 and 13 will be passed when each hall devices 12 and 13 are equipped with York 21 and 22 while operating like the non-contact mold MAG switch 10 of drawing 1 , the sensibility of hall devices 12 and 13 may be raised.
[0024] Drawing 4 shows the third operation gestalt of the non-contact mold MAG switch by this invention. In drawing 4 , if the non-contact mold MAG switch 30 removes a point equipped with two hall devices 31 and 32 arranged by the reverse sense so that it may contact mutually together with instead of [of the hall devices 12 and 13 which touch back to back mutually] as compared with the non-contact mold MAG switch 10 shown in drawing 1 , it is the same configuration. According to this configuration, it will operate like the non-contact mold MAG switch 10 of drawing 1 .
[0025] Drawing 5 shows the fourth operation gestalt of the non-contact mold MAG switch by this invention. In drawing 5 , if the non-contact mold MAG switch 40 removes the point that York 41 and 42 is attached in order to raise the sensibility to magnetic flux to each hall devices 31

and 32 as compared with the non-contact mold MAG switch 30 shown in drawing 4 , respectively, it is the same configuration. Since according to this configuration the magnetic flux from magnet 3a will be brought together in these York 41 and 42 and hall devices 31 and 32 will be passed when each hall devices 31 and 32 are equipped with York 41 and 42 while operating like the non-contact mold MAG switch 30 of drawing 4 , the sensibility of hall devices 31 and 32 may be raised. Furthermore, since the both sides of hall devices 31 and 32 are equipped with York 41 and 42 as compared with the hall devices 12 and 13 equipped with York 21 and 22 shown in drawing 3 in this case, respectively, the sensibility to the magnetic flux of hall devices 31 and 32 may be raised further.

[0026] Drawing 6 shows the fifth operation gestalt of the non-contact mold MAG switch by this invention. In drawing 6 the non-contact mold MAG switch 50 While having two hall devices 51 and 52 which were made to suit among the back mutually instead of the hall devices 12 and 13 which touch back to back mutually as compared with the non-contact mold MAG switch 10 shown in drawing 1 , contacted horizontally [it is alike and], and were arranged It is the same configuration, if the point that York 53 and 54 is attached is removed in order to obtain the sensibility to magnetic flux respectively horizontal to each hall devices 51 and 52. According to this configuration, each hall devices 51 and 52 are related horizontally, and it does not have sensibility, but since the magnetic flux from magnet 3a will be brought together in these York 53 and 54 and hall devices 51 and 52 will be passed by having York 53 and 54 which extends horizontally, it will operate like the non-contact mold MAG switch 10 of drawing 1 .

[0027]

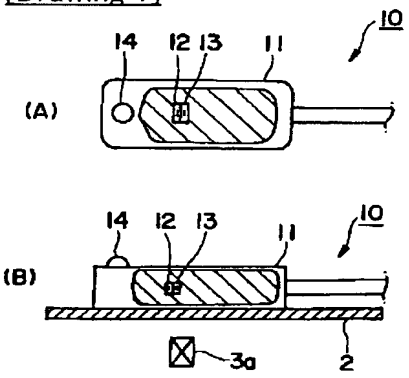
[Effect of the Invention] Since two hall devices of each other are arranged by the reverse sense according to this invention as stated above, even if it is the magnetic flux of the sense of which, one of hall devices may sense this magnetic flux. Therefore, since a non-contact mold MAG switch will not have a polarity, the attachment direction will not be specified, for example to a pneumatic cylinder etc., and anchoring may be performed easily. In this way, according to this invention, even if the magnetic polarity of the magnet which should be detected is which direction, the extremely excellent non-contact mold MAG switch with which location detection may have been made to be ensured is offered.

[Translation done.]

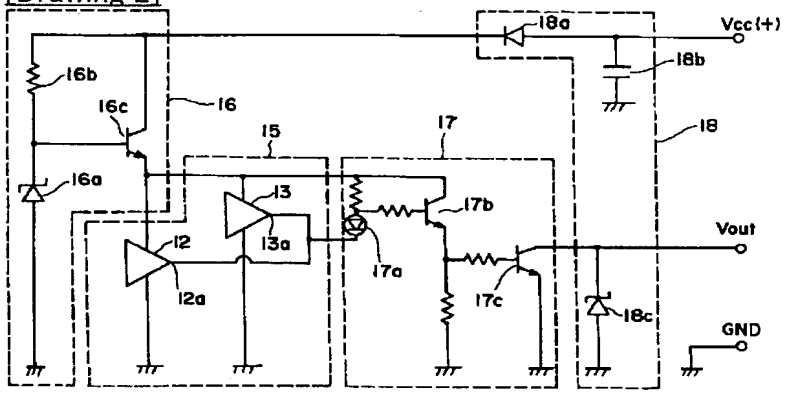
* NOTICES *

DRAWINGS

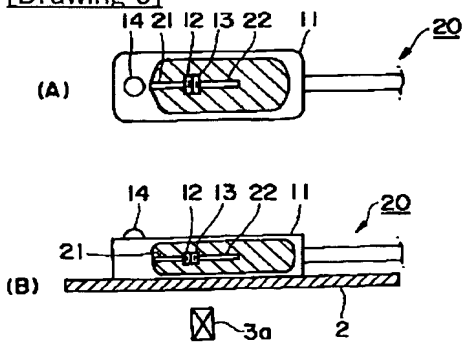
[Drawing 1]



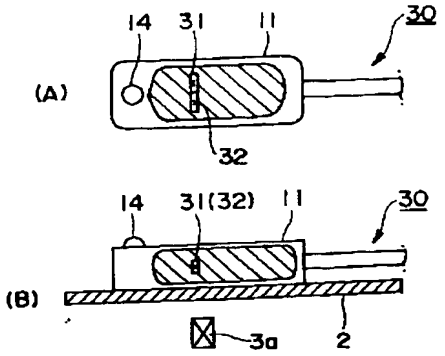
[Drawing 2]



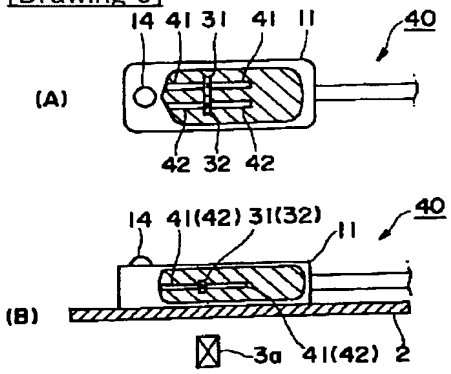
[Drawing 3]



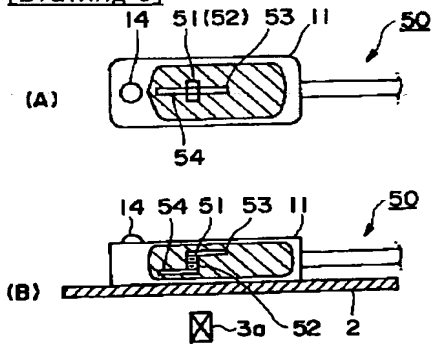
[Drawing 4]



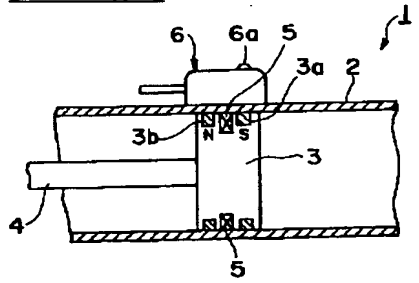
[Drawing 5]



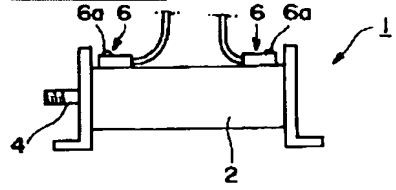
[Drawing 6]



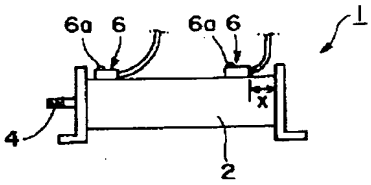
[Drawing 7]



[Drawing 8]



[Drawing 9]



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